



## **the watering hole**

**Pachyderm Expansion/Savanna Retrofit**

**by: Kristen Milek**

**Advisor: German Cruz**

**Professors: A. Hoover**

**R. Spangler**

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**Zoological Gardens are visited each day by numerous people throughout the world. “More than 134 million people visit accredited zoos and aquariums in the United States every year” (Lee). The progress that has accord to the aesthetic of the exhibits has played an important role in the development of what is today’s modern zoo. The more realistic the habitat of the specie is the better off it is for the specie, the visitor, and the keeper. According to Ray Robinson, from the University of Michigan:**

**A good zoo exhibit is about people, animals, and plants. It is an exhibit that makes people feel good about the animal, understand the animal/plant/people relationship, and educates the zoo visitor about major concepts of conservation. A good zoo exhibit is fun for the zoo visitor (1985).**

**A zoo exhibit is not just something for visitors to gaze upon; it is an experience for visitors to identify with by placing themselves within the habitat of the animals.**

**This study of zoological design proposes to design an exhibit in such a way that the animals, zoo keepers, and visitors are all able to interact and learn from one another. The interaction between these three users groups are in conflict with one another. The visitor wants to view the animals in action; the keepers want their safety with the animals, and the animals need their privacy and solitude. The study will look at several case studies, current developments, and historical presidencies to make a case for modern zoological design. Zoo’s today need to be interactive, educational, and safe for all age and demographic groups. According to Kenneth Polakowski, from the University of Michigan:**

**It is the designer’s task to get the visitors involved with the exhibit to the highest level of interaction. The viewers must be encouraged to experience the zoo beyond the mere level of reacting to physical sensations. They must be enticed to interact at the perceptual level; where strong mental images are formed through the processing and organization of all the sensations that they experience. The educational goal of the designer is to produce an intellectual reaction...(1987).**

**Polakowski, K. J. (1987). Zoo Design: The Reality of Wild Illusions. The University of Michigan: Michigan.**

Polakowski explains the problems that zoos face as far as the users that need to be pleased by the zoo, 'the animals, visitors, and management all need to be addressed in a single design' (Polakowski). He explains why people go to the zoo, 'to experience the unusual.' There is also a detailed history of the development of the modern zoo. Most importantly he discusses designing an exhibit from the viewpoint of the landscape architecture. He compares the needs of the different user groups and explains the need to balance all of their needs.

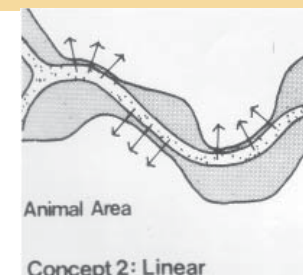
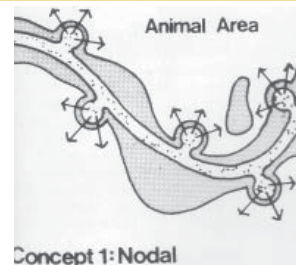
Polakowski in great detail explains the importance of four specific developmental goals for a zoo overall. However, I feel that these four goals must be incorporated in every zoological exhibit in order for the overall zoo to be able to reach these developmental goals. The goals include that visitors to the zoological garden be entertained, educated, better understand conservation, and to experience the research being completed by the zoological scientists of the park. The educational goal is broken into

three different ways in which the educational goal may be reached. These include educational centers, interpretation that can include from naturalists lectures to display signs of each animal specie, and passive education. The current educational trends according to Polakowski tend to be, '...exhibit design using immersion impact and sequential viewing, cultural exhibits, participatory displays, interpreters and educational staff, animal demonstrations, and special tours...' The educational aspect of this book was also great because of the direct relationship it shows between exhibit design and exhibit interpretation. In this sense of landscape architecture design is education and interpretation for visitors to the zoo to experience.

Polakowski lastly puts great emphasis on exhibit sequence, exhibit circulation, and exhibit viewing. He states that when 'designing an animal specie exhibit all three of these issues must be addressed together, not separately.' This is because there is a great need for anticipation when circulating from one exhibit to the next. It is important for visitors to fully immerse themselves with the animals and their natural habitat. The sequence of spaces, circulation, and the viewing of animals at the right moment can make or break a quality zoological garden.

**toledo  
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## **literature review**



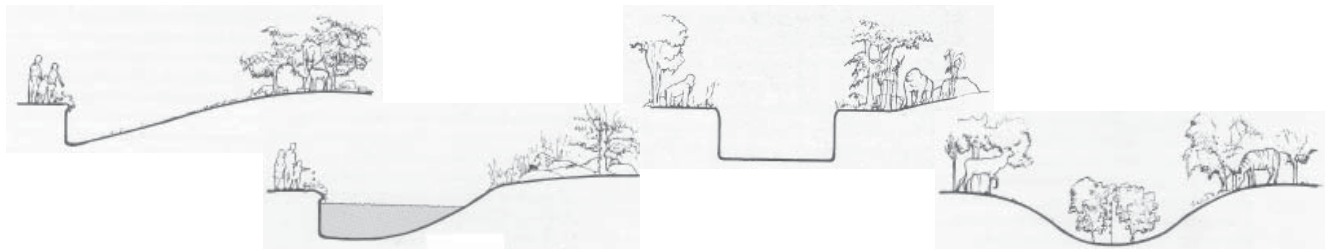
**Wylson, Anthony and Patricia. (1994).  
Theme Parks, Leisure Centres, Zoos  
and Aquaria. New York, NY: John  
Wiley and Sons, Inc. (Original work  
published by Longman Group UK  
Limited 1994).**

The Wylson team describes the zoo today as being a place where, "The welfare of the animal is the first priority for most zoos, to provide a healthy environment, combat boredom and to give each species a sense of dignity." They discuss the differences between city zoos, specialist zoos, and educational zoos. To discuss the city zoos they use the Central Park Wildlife Conservation Center in New York and the Emmen Zoo in Holland. To discuss the Specialist zoos the Arizona-Sonora Desert Museum in Tucson, AZ and the Apenhuel in Apeldoorn, Holland are used. The Drusilla's Zoo Park in Alfriston, Sussex and the Adventure Island, Los Angeles Zoo, CA are used to discuss the education zoos. The most important thing that the Wylsons' explain are the various design approaches to the animal enclosures with safety for the animals and visitors as the number one concern.

Here are some great examples of current ways in protecting visitors and zoo keepers from the animal species. There are four main ways that this is accomplished and they are one-sided dry moat, water moat, two-sided dry moat, and two sided trench and fence. Depending on the animal specie the safety requirements vary. The example of the Elephant Forest at the Woodland Park Zoo uses two of the different moat techniques and the Sea-lion exhibit at the Singapore Zoo uses the same techniques, however water enclosure is also included with this example. The Wylson team has done an excellent job describing how to keep visitors safe when observing the unique species at zoological gardens.

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## **literature review**



**Young, R. J. (2003). Environmental Enrichment for Captive Animals. Malden, MA: Blackwell Publishing Ltd.**

Young discusses how to enrich an animal's life through the environment. He does not only discuss how, but also why. The depth of research that has been done on various ways to enrich an animal is very interesting. He argues that the reasons why to enrich animals is so that their longevity increases, to hopefully form a bond between the animal and the trainer, to increase the welfare of the animal, and to allow the animals the ability to engage in more of their natural actions. The two ways that he discusses how to enrich animals in this way are the naturalistic approach and the behavioral engineering. The most interesting topic that Young describes is the difference of how the various species socialize among each other. The charts that compare the various species is very helpful to understand how designing for each animal is truly a completely different design challenge.

Young argues that enrichment is the key to 'happy animals'. He also believes that correcting an animal's unusual habit right away is important

because evidence has been found from his experience that when a large carnivore for example has been moved to a larger zoo their unusual behavior is irreversible. The animals will engage in the enrichment activities, but depending on the length of time the animal has repeated the unusual behavior it will sadly continue. Resolving the unusual behavior is ideal when it first begins and enrichment assists in solving this problem. The enrichment devices are different for each species and learning how to design an appropriate one for each species is tricky. There are numerous examples that Young provides to enrich an animal's life, for example the cheetah. A few of Young's design principles for enriching cheetahs are as follows, '...the cheetah should use its specialized visual system to detect its prey, i.e. a system designed to detect moving objects in the horizontal plane. The prey should be pursued at high speed before it is caught or manages to escape. The cheetah should not control the availability of the prey since in their natural environment they hunt only once a day.' The design criteria varies for each species, which makes it difficult to assign a standard for enriching zoo animals. There are however, enrichment ideas for each animal species that assist in the longevity and happiness of the animal's lives that are part of zoological gardens.

## **Kansas City Zoo - African Plains**

**The African Plains is a common exhibit in many zoological gardens throughout the country. The African Plains that I researched in particular is located in the Kansas City Zoo. The exhibit was designed by Bassett Associates from Lima, Ohio. The African Plains opened in 1995.**

**The African Plains site is an extension of the original zoo and is located in the center of a mature wooded area. The site is made up of 95 acres and visitors to the exhibit must enter by tram and cross a deep river canyon. This traveling experience acts as a gateway to the plains because as the visitor moves through the thickly shaded river canyon there is a light at the end of the tunnel; when the visitor arrives on the other end there is an overhead view of the plains in its entirety. The foot path experience begins here on the safari pathway.**

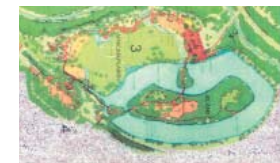
**Along the pathway visitors experience many different views of the plains as well as many different species of animals. The first up-close exhibit that is experienced is the cheetah; visitors are able to view the cheetah with their prey directly behind them in their completely safe and separate exhibit. The visitors viewing the lion**

**exhibit has this same experience of better understanding the predator-prey relationship. The veldt that is located behind their predators includes more than 50 animals, such as zebra, giraffe, ostrich, and impala. The veldt is in the center of the site in an oval shape with the hoof stock's predators surrounding it on 2 sides, visitor view on 1 side, and a watering hole stream on the other side. Visitors are also able to see the veldt from the water hole by a guided paddle boat in the summer months for more viewing opportunities. There is a hotwire placed in the water that allows the animals to go out only so far for the safety of the visitors. This allows for multiple viewing and circulations patterns throughout the plains.**

**The viewing and circulation patterns that the visitors are able to experience are what interested me most about this site. For example, in the African Plains all of the service entrances are greatly hidden by the door becoming part of granite boulder, which looks like it is part of the exhibit. Visitors viewing the species are able to see them from multiple levels whether it is from a paddle boat, the high bridge, or from the view of the predator all of the animal species are apparent from numerous levels. This allows visitors to immerse themselves in the animal habitats**

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## **case studies**





## **Toledo Zoo - Arctic Encounter**

**The Arctic Encounter is the largest project that the Toledo Zoological Garden had ever undertaken throughout its' history. The exhibit was designed by CLR Associates. The firm has been fortunate enough to have worked with the Toledo Zoo extensively with numerous other exhibits such as the Aviary and the Primate Woods. The exhibit opened in the winter of 1999, a perfect time to introduce the arctic species into their new home in the Toledo Zoological Garden.**

**The exhibit includes two species, which are the polar bear and the seal. These two species share an interesting predator-prey relationship; they are separated by a 2 inch thick piece of glass. The visitor is able to see the seals safely swimming below their predator. The separate exhibits for the two species are also completely interchangeable, meaning that the seals can safely live in the polar bear exhibit and the polar bears can safely live in the seal exhibit.**

**The overall size of the exhibit is 3.5 acres and it was a \$12.5 million project. The polar bear side of the exhibit includes a land area of 6000 sq. ft. and a 1600 sq. ft pool that is 12 feet deep and chilled to 60 degrees. The seal side includes**

**a land area of 4000 sq. ft. and a 3000 sq. ft. pool that is 8-12 feet deep and is also chilled to 60 degrees. There is also a freshwater stream that runs through the polar bear side, which is stocked with fish sporadically so that the bears can practice their hunting skills. The predator hunting of fish in the exhibit is also a new idea for the animals to enhance their activity and relate the animals as closely as possible to their natural environment. The animals are happy and the visitors are also happy when seeing the animals in their natural habitat.**

**The visitor is able to view the animals from 3 different levels, which are above, level, and below. The below level is my favorite which is where you are actually able to see the polar bears walking or swimming above the seals swimming. The visitor is able to interact with the natural environment of the polar bear with the interpretive building. Visitors are able to learn about the animals and people that inhabit the arctic region of the world in the interpretive building. The activities that visitors partake in are things such as an arctic survival course or walking across "permafrost." The Arctic Encounter is a success for the animals most importantly, but also a huge success for the visitors.**

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## **case studies**





## **Woodland Zoo - Asian Elephant Forest**

The Asian Elephant Forest from the Woodland Park Zoo in Seattle, Washington was designed by Jones and Jones and opened during the summer of 1989. This elephant exhibit is an older exhibit, but it is a great precedence to look at for various reasons such as the hands-off management and the open-door access. This exhibit won the 1990 AZA Exhibit Award. The species of elephants that are included in this exhibit are 4 female Asian and 1 female African elephant. The exhibit is part of the zoo's Tropical Asia exhibit zone.

The design was largely influenced by the Thai life, which is the native habitat of the Asian Elephant. This influence is evident in the temple like barn with steep roofs that represent the traditional Thai buildings. The design has two main outdoor spaces for the elephants. They were designed as a logging camp and a clear in a tropical forest to showcase the elephants in two different exhibits. The goal of the logging camp was to enable the animals to interact with logs in the proximity of saddles, tack and bells, to simulate the close interaction that the elephants have with the Thai people. Design details such as

this allow visitors to the zoological garden to better understand the animal's natural environment.

There are many comforts that have been considered when designing for these massive animals. They include an open-door access all year round from their exhibit to their barn. A couple of the features that are included in the barn are radiant heating and cushioned aircraft carrier flooring to help alleviate the foot pain the elephants might experience. The barn also has a great air circulation flow with an advanced HVAC that allows for 10 changes per hour, this helps alleviate strong odors in the holding area. Outside of the barn the soil is finer so that when the soil is ingested it moves through the digestive system easier. Design elements such as these have enhanced my understanding of the importance of animal movement throughout the exhibit area.

Since the exhibit opened there has been a new addition to the Asian Elephant family. The calf was born on November 3, 2000, which marked the first elephant birth in Washington. The calf is still healthy 4 years later and there is now 4 female Asian elephants and 1 African elephant within the elephant forest.

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## **case studies**



### **The Influence of These Case Studies:**

- ~ **Multiple visitor views at different levels**
- ~ **Engulfing the animals and visitors in the natural habitat of the specie**
- ~ **Engulfing the visitors in the human culture that surrounds the species**
- ~ **Sequence of views to understand how the species relate with one another (predator/prey relationship)**
- ~ **Understanding the impact the animals have on their land**
- ~ **Interpretation of the species, the land, and the culture**

## **The Mission**

**Our mission is to promote wildlife and its conservation through excellence in animal management, educational programs, and scientific activities while providing our visitors with an enjoyable, recreational, and family-oriented experience.**

## **This mission will be accomplished by meeting the following objectives:**

- ~ **Establishing and maintaining animal exhibits that reflect natural habitats, and are conducive to our animals' well-being.**
- ~ **Creating an educational setting that leads our visitors to a better understanding of, and appreciation for, our complex relationships with wildlife and our environment.**
- ~ **Providing a long-term refuge for rare and endangered species for the purpose of their protection, propagation, and conservation.**
- ~ **Supporting and participating in scientific programs which contribute to our knowledge of animals and their habitats.**
- ~ **Providing our visitors and employees with a clean, safe, and pleasant facility.**
- ~ **Responding to community needs and interests and building a broad base of community support and involvement.**
- ~ **Operating on a sound business basis.**

**1. Atmosphere** - The animal exhibit must stimulate the animal's natural habitat, produce an atmosphere similar to the animal's environment, focus on the outstanding physical features of the animal, and emphasize the ecological relationships between animals, plants, and man.

**2. Connection** - The visitors must feel as if they are engulfed in the animal's habitat to be able to better understand the life of the specific specie the visitor is experiencing.

**3. Recreation** - The exhibit must be recreational for the different animal species as well as the visitors viewing the animal species. The recreational activities for the animals should discourage pacing by the animals as much as possible.

**4. Education** - The design of the exhibits must be as educational as possible. Imaginative education programs and interactive interpretation displays can enhance the recreational aspect for the visitors.

**5. Conservation** - Zoo exhibits must enhance the principle of conservation so that visitors to the zoo understand how education of the species presence in the zoo allows for the wild to be better conserved. As animal rights laws change

conservation in zoos becomes more evident.

**6. Research** - Research of the specific animal species must be a possibility with in each of their individual exhibits. Maintaining a healthy breeding system must be enhanced, which indicates that the exhibit must be dynamic to allow for animal transfers from one zoological garden to another.

**7. Habitat** - Visitors circulating through the different exhibits must experience a change in habitat from one animal specie to the next specie. This may be accomplished by different plant types, material changes, and thick or thin shade.

**8. Impact** - The exhibit should educate the visitors of the human activity that surrounds the animal species in their natural environment. Included with this should be how humans affect the animal species in a positive and negative way.

**9. Relationship** - The different specie exhibits should be arranged in a predator-prey relationship, which means that the exhibits will be separate, but to the visitor it will appear that they are living in the same space.

**10. Layering** - The different exhibits should all be designed in a layering fashion. There should be a minimum of 2 layers for each exhibit. It is important for the visitor to view the animal species at multiple levels.

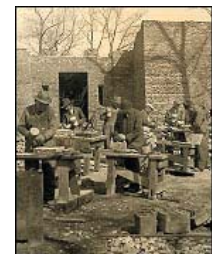
**design goals - reflecting literature, case studies, & zoo mission**

## Time Line

- ~ **1900** – A woodchuck donated 1899 to the City of Toledo's Parks Board
- ~ **1930's** – 5 Spanish Colonial-style buildings, constructed by the Works Progress Administration and the Federal Emergency Relief Act during the depression
- ~ **1933** – Reptile House first building constructed by FERA, 1 of 7 reptile houses in the world
- ~ **1982** – transfer of ownership to the Toledo Zoological Society, marked the a new era of improvements and progress
- ~ **1983** – African Savanna opens including the world Famous Hippoquarium, the first habitat exhibit
- ~ **1988** – The Giant Pandas visit the zoo for 6 months
- ~ **1993** – Kingdom of the Apes opens
- ~ **1996** – Carnivore café opens, the old cat holding facility and exhibits, is now a food court where the visitors are able to experience looking out of a cage
- ~ **1998** – Aviary renovated, 1 of 5 FERA original buildings
- ~ **1999** – Arctic Encounter opens as the centennial anniversary celebration
- ~ **2001** – Gray Wolf exhibit opens
- ~ **2003** – Louie, a male calf African Elephant is born
- ~ **2004** – Africa opens and is the largest exhibit the zoo has ever added on, it is 12 acres in size

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## historical zoo time line



## **Claims to Fame:**

- ~ **1933** – 1 of 7 reptile house in the world constructed by FERA
- ~ **1983** – the world famous Hippoquarium opens
- ~ **1988** – the Giant Pandas visit the zoo
- ~ **1999** – The Arctic Encounter opens to celebrate the centennial anniversary of the zoo
- ~ Nationally recognized as one of the most comprehensive zoological institutions in the nation.

## **Successful Achievements:**

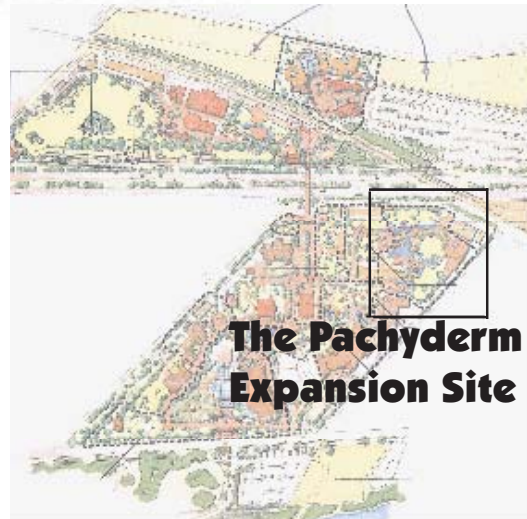
- ~ **4 Cheetah cubs** born June 24, 2004, 1st litter for Shaka
- ~ **1 baby Orangutan** born April 23, 2004, 1st born for Kutai and Boomer
- ~ **1 male calf, Louie**, born April 30, 2003, 1st calf for Renee
- ~ **3 Amur Tiger cubs** born May 29, 2003, 1st litter for Sasha and George
- ~ **2 African Wild Dog** born December 15, 2002, 2nd litter for Lucy and Luke
- ~ **1 Asian Sloth Bear** born February, 2002, 1st litter for Han and Deva
- ~ **1 Hippo calf** born in 1987, 1st time ever able to watch a hippo being born under water by humans
- ~ **5 cub Snow Leopards** born over the years

## **zoo achievements**





## Surrounding Zoos

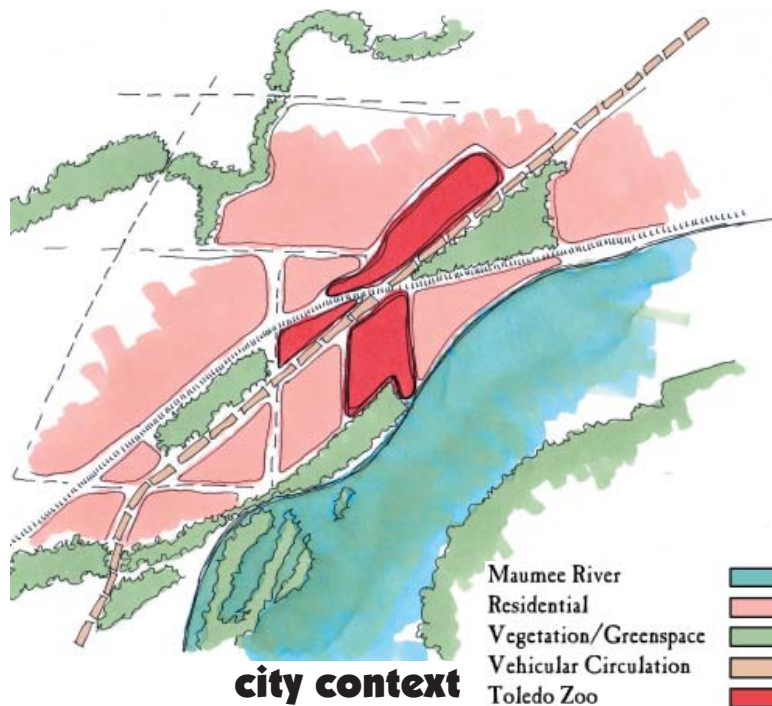


The site that I have selected for my comprehensive project is located in the Toledo Zoological Garden. The design firm CLR Design Inc. from Philadelphia, Pennsylvania has recently completed the zoological garden's 15 year comprehensive master plan. They have made design suggestions such as enhancing the entry promenade, enlarging the tropical conservatory, expanding the Great Ape exhibit, and expanding the Pachyderm exhibit. I have chosen to focus my comprehensive project on the expanding Pachyderm exhibit.

The Pachyderm site is expanding for numerous reasons. Some of these reasons include the new birth of an African Elephant, the African species such as the giraffes moving to the new Africa exhibit, and just the need for visitor circulation and specie viewing within the site to be renovated to further educate the visitors to the zoological gardens. There are three levels of importance for the 15 year comprehensive plan to be implemented. The Pachyderm expansion/Savanna retrofit is on the first tier of priority. It is also the only animal exhibit adjustments that have been suggested for the first level of importance. There are however, other areas on the first tier of importance, which include for example the new Children's Village and the new South Gate Complex.

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**zoo location & site selection**



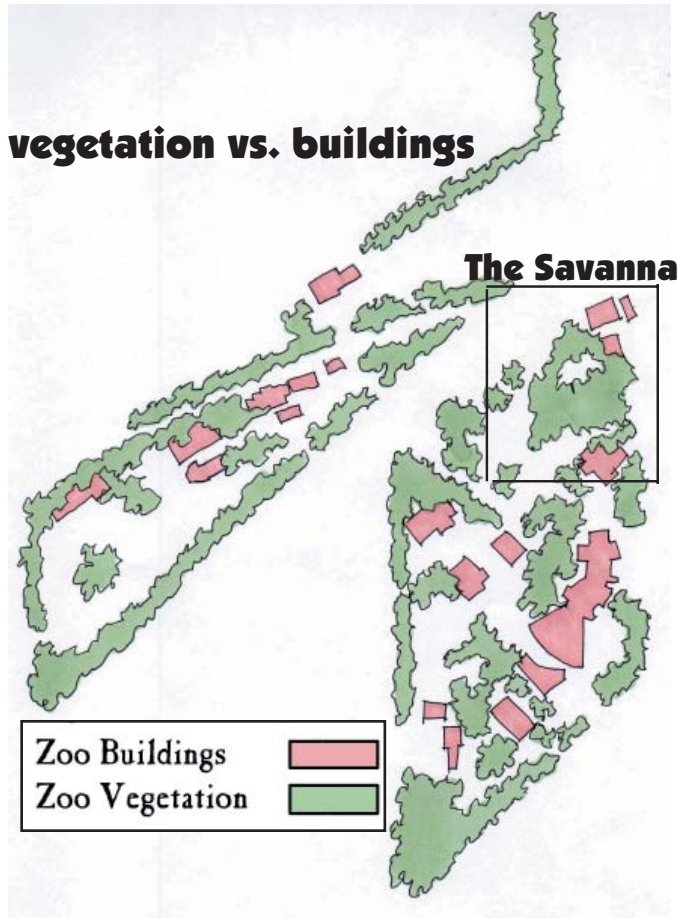
The Toledo Zoological Garden is located on the South side of Toledo. It is however, located in the central area of the metropolitan area of Toledo. The Anthony Wayne Trail is a 4 lane highway that separates the old zoo from the new zoo. However, the north and the south side of the zoo has been connected by a pedestrian bridge. This bridge also now acts as a gateway into the zoological garden. It is fun to view people in moving automobiles like they are a zoo exhibit. The zoo is surrounded by residential areas, which includes some historic homes of Toledo.

The surrounding area of the zoo is residential, which is a good thing as well as a bad thing for the zoo. It is a good thing because as homes go for sale the zoo is able to purchase the homes for further expansion, but it is also a bad situation for the zoo because there is the chance that there is a home owner who refuses to sell and holds out as long as possible. There is always the process of eminent domain, but this is a lengthy process, which can put a bad taste in the mouth of the other surrounding home owners. There are not any natural constraints that the zoo faces other than existing city greenspace and Maumee River, which is about 0.5 miles south of the zoo.

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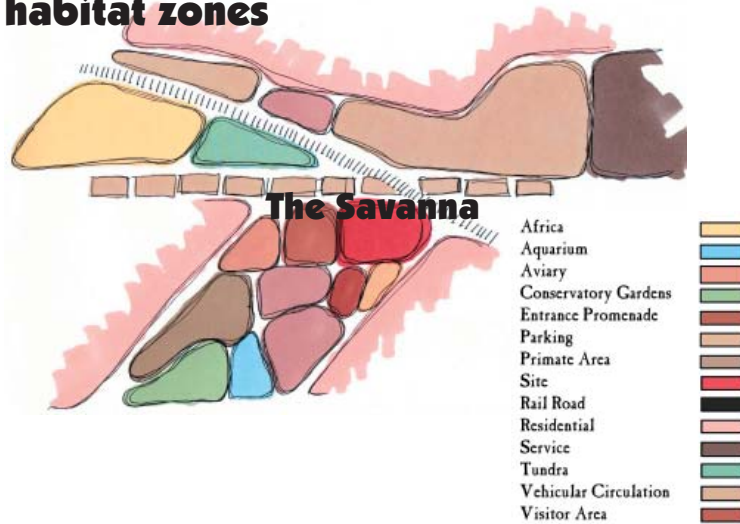
**site context in toledo,ohio**

## vegetation vs. buildings

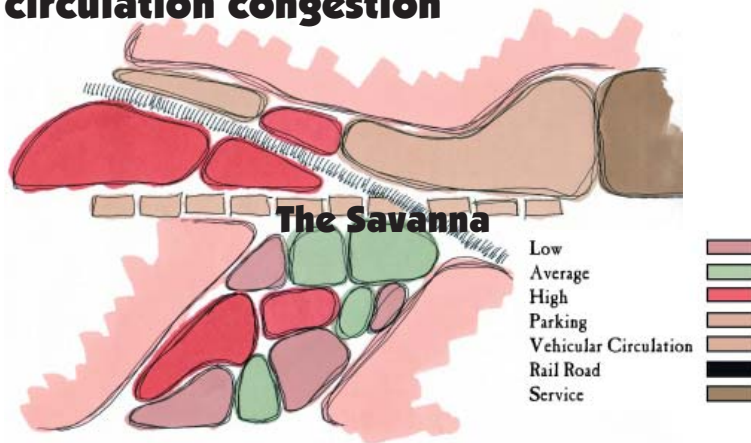


This drawing shows the zoo in a solid/void diagram of where the mature vegetation is in the Toledo Zoo and how the built structures of the zoo relate to the vegetation. It is evident from this drawing that my site has the most mature vegetation in the zoo. This is most likely because it was the first exhibit in the zoo that was designed in a zoological garden style in 1982. The current vegetation in this part of the zoo is very nice during the summer months because it provides shade for visitors. However, for visitors to truly understand the habitat of the Savanna the woody vegetation may need to be replaced with grasses. This will make the Savanna area warmer in the summer, but it will truly allow people to feel the climate of the Savanna during the summer months.

## habitat zones



## circulation congestion



## Habitat Zones:

This drawing shows the habitat zones of the Toledo Zoo and how they all relate to each other. It is also evident from this drawing how large the parking area is compared to the space that the animals are allotted. It is disappointing to see this comparison; the hope of the zoological society is to eventually have a built parking garage structure so that more exhibits can be constructed where the existing parking area is located.

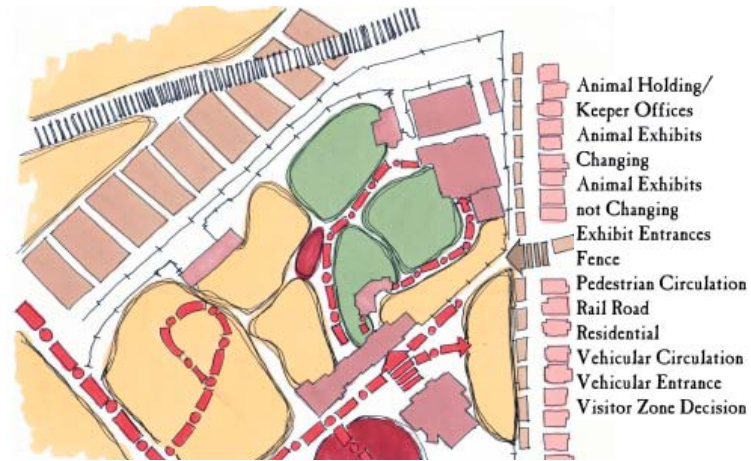
## Circulation Congestion:

This drawing shows the popular exhibits that visitors to the zoo are most likely to visit. It is evident that the Savanna that I am working with is visited moderately. This is most likely because it has been 20 years since the exhibit has changed. I hope that with this retrofit of the "The Watering Hole" will become a highly visited area. The most southern parts of the zoo are the least visited because of several reasons, but the largest influence on this is that it is the furthest away from parking area and there is not much area for large gathering spaces for passive recreation like picnicking. The 15 year master plan has taken this into account and one suggestion is to enlarge the aquarium and for there to be more parking on the south side of the zoo.

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**habitat zones & the popular exhibits**





**current exhibit space**



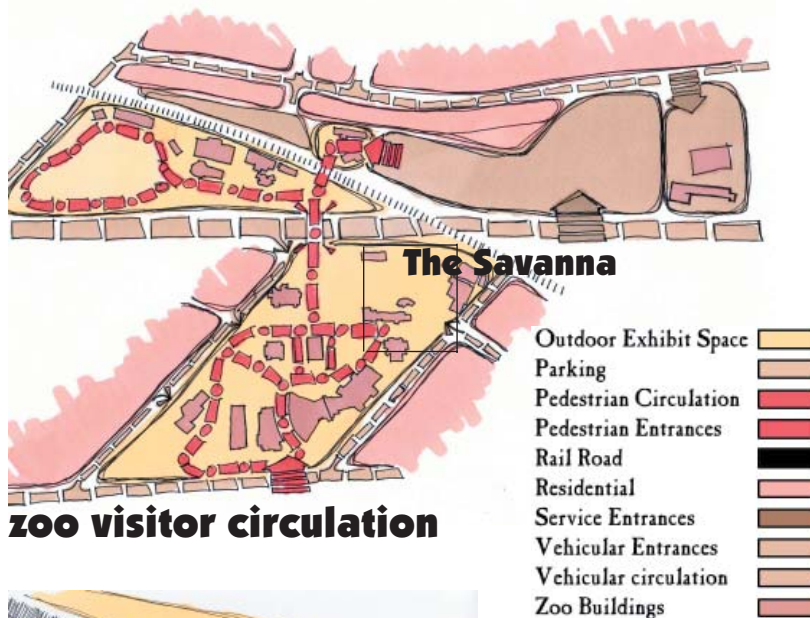
**exhibit space expansion**

## Current Exhibit:

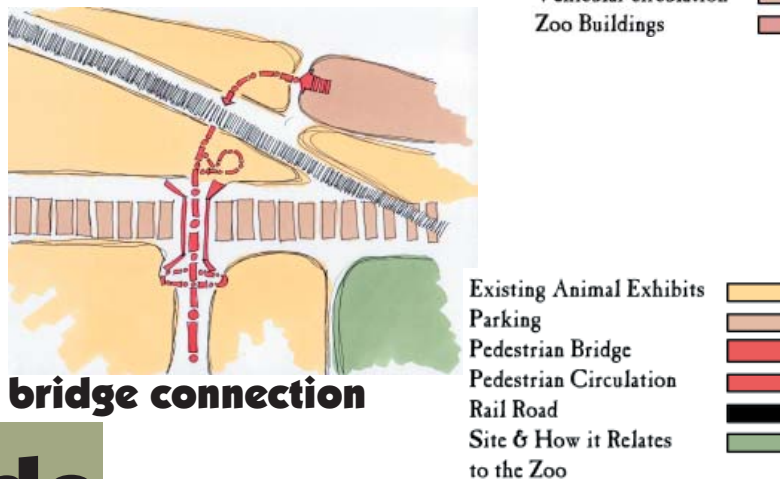
This drawing shows the size of the current exhibit and how they relate to other spaces of the zoo that surrounds the pachyderm species that I am focusing on in my design. It also shows closer how the current circulation works through the site. It is interesting to see the size of the space when comparing it to the amount of space the road takes up just north of the site.

## Exhibit Expansion:

This drawing shows how the pachyderm exhibits are going to expand into the current bongo exhibit and into the children's village. The Savanna area is going to be expanded about 1.75 acres. From this drawing it is still evident that the existing predator exhibits are not going to change, which is excellent so that visitors to the zoo will still be able to understand the predator/prey relationship that they have. Both of these drawings communicate how close the residential area is to these large mammals and how close the busy 6 lane Anthony Wayne Trail Highway is to the exhibit. It is evident that the Savanna area of the zoo is going to almost double in space.



**zoo visitor circulation**



## visitor circulation:

This drawing demonstrates the main pedestrian circulation through the zoo. It is evident that because the main circulation root does not pass by the Savanna, this is the reason the Savanna is not one of the most visited areas of the zoo. The design changes that I am proposing will have this area of the zoo directly off of the main circulation path, which will increase the amount of visitors to this part of the zoo.

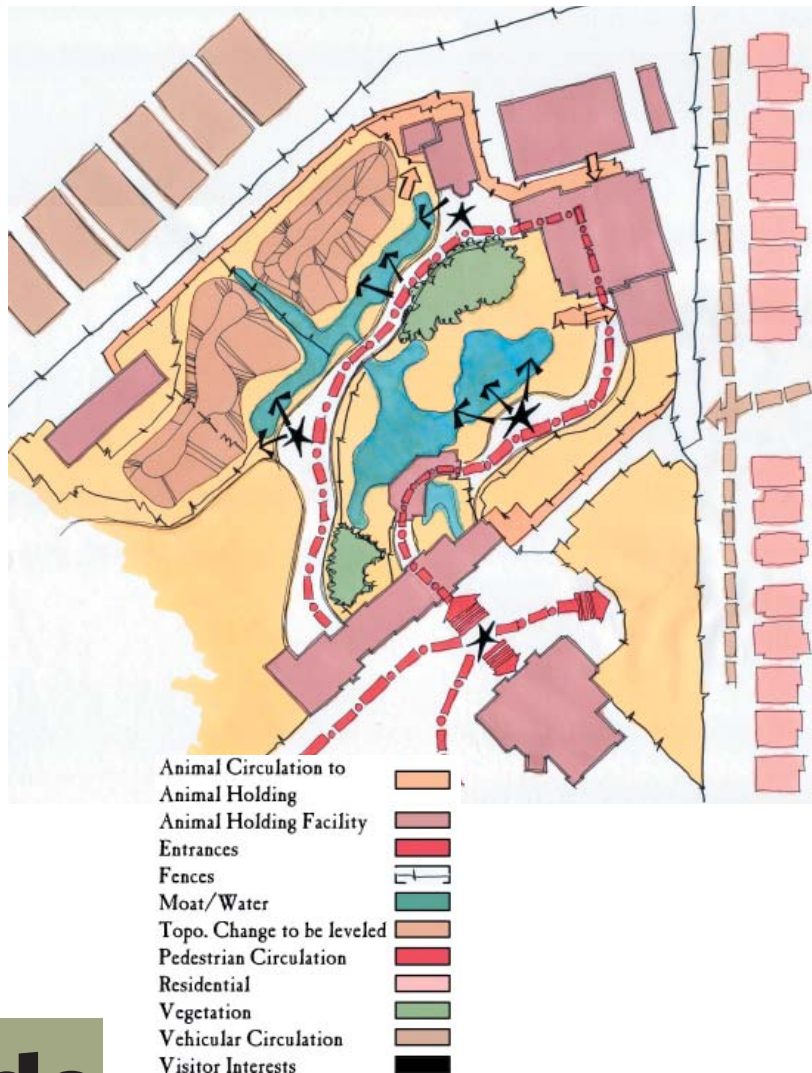
## pedestrian bridge:

This drawing shows how the north and south parts of the zoo are connected safely over the busy 6 lane Anthony Wayne Trail Highway. It clearly demonstrates how the pedestrian bridge is also connected to the parking area of the zoo. If visitors to the zoo desire they are able to walk all the way to the south part of the zoo and work their way to the north part of the zoo with out any interference with vehicles. The implementation of the pedestrian bridge has been a great addition to the aesthetics of the zoo.

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**visitor circulation paths**





## Site Conditions:

- ~ There is a 4 lane highway (the Anthony Wayne Trail) on the north side of the exhibit.
- ~ The Reptile and Children's Village is south of the Pachyderm extension/Savanna retrofit.
- ~ Residential neighborhoods are west of the Pachyderm extension/Savanna retrofit.
- ~ There is a hoof stock exhibit that has been moved to the Africa exhibit, which be integrated into the expanded exhibits of the elephants, rhinos, and hippos
- ~ The soil must be refurbished for the animal species that are currently inhibiting the exhibits.
- ~ Pedestrian circulation needs to be reconfigured with the expansion of the exhibits.

## Elements of Site:

- ~ The site is naturally flat like the natural topography of the area, however there has been numerous land berms and moats constructed for the exhibits and for the interest of the animals.
- ~ The site currently has 4 holding facilities for different species. There is an elephant/giraffe aviary that needs to be redeveloped; the giraffes have been moved to the Africa exhibit.
- ~ The site is surrounded directly by 5 buildings, which are for animal holding facilities as well as indoor museums.

## exhibit inventory & analysis

- ~ The visitors to the Pachyderm/Savanna area of the Toledo Zoo experience this region currently in a circular fashion. There is only one viewing side to each of the exhibits, however, there are different levels at which the visitors can view the animals. An example of this is the hippo exhibit habitat.

**The Savanna area of the zoo was the first area of the zoo to be transferred into a zoological garden exhibit. It was designed by Jones and Jones out of Seattle, Washington and the grand opening was in 1983. The Savanna was the Toledo Zoo's kickoff to gaining more support for the zoo so that it would be an accredited zoo from the American Zoological Association. The zoo is now an accredited zoo and it has changed immensely over the past 20 years.**







**The opening of the Savanna put the Toledo Zoo on the map because of its unique hippoquarium. The hippoquarium is the hippo pool that viewers are able to see through a plate of glass. It was the first time that an aquarium of its size was successful with all of the aspects that the hippoquarium needed in order for it to be successful. The hippoquarium is able to be completely drained for a monthly cleaning and then refilled fairly quickly. When it is drained the excrement is also cleaned out of the hippoquarium; this being done successfully is what made the Savanna a must see of the Toledo Zoo. The hippoquarium allowed the birth of Bubbles to be the first ever witnessed birth of a hippo calf. The fame of the**

**hippoquarium has led me to the decision that it is an asset to the Savanna area and it is going to remain the same. However, the land area of the hippo exhibit will change. The African Elephant and Rhino exhibits have been successful as well, but there is a need for more space for both species because there have been additions to both species.**



## The Clients:

- ~ **The animals** - they must be as comfortable and content as possible with their safety always as the number one concern for the design
- ~ **The visitors** - they must continually be educated throughout their experience through the Pachyderm exhibit by passive, interpretive displays, and or by tour guides
- ~ **The Keepers** - they must be safe at all time. Their interaction with the animals must be considered with all levels of the design

habitat zone	area	changes	zone
female african elephant	12000 sf	Renovation of the existing exhibit with items such as additional water	
male african elephant	21300 sf	New habitat zone with main items such as a watering hole and gently sloping topography	
hippo expansion	2000 sf	Additional land habitat and holding facility expansion	
rhino expansion	13500 sf	Renovation and expansion of existing habitat with items such as gently sloping topography and removal of the water moat	
pedestrian circulation	9675 sf	Three different levels of pedestrian circulation, pedestrian entrances, and pedestrian pavilions	
pedestrian interpretation	1790 sf	Multiple Masai Huts for interpretation of the culture that surrounds the large pachyderm species	

**toledo**  
**ZOO**

**exhibit programming**

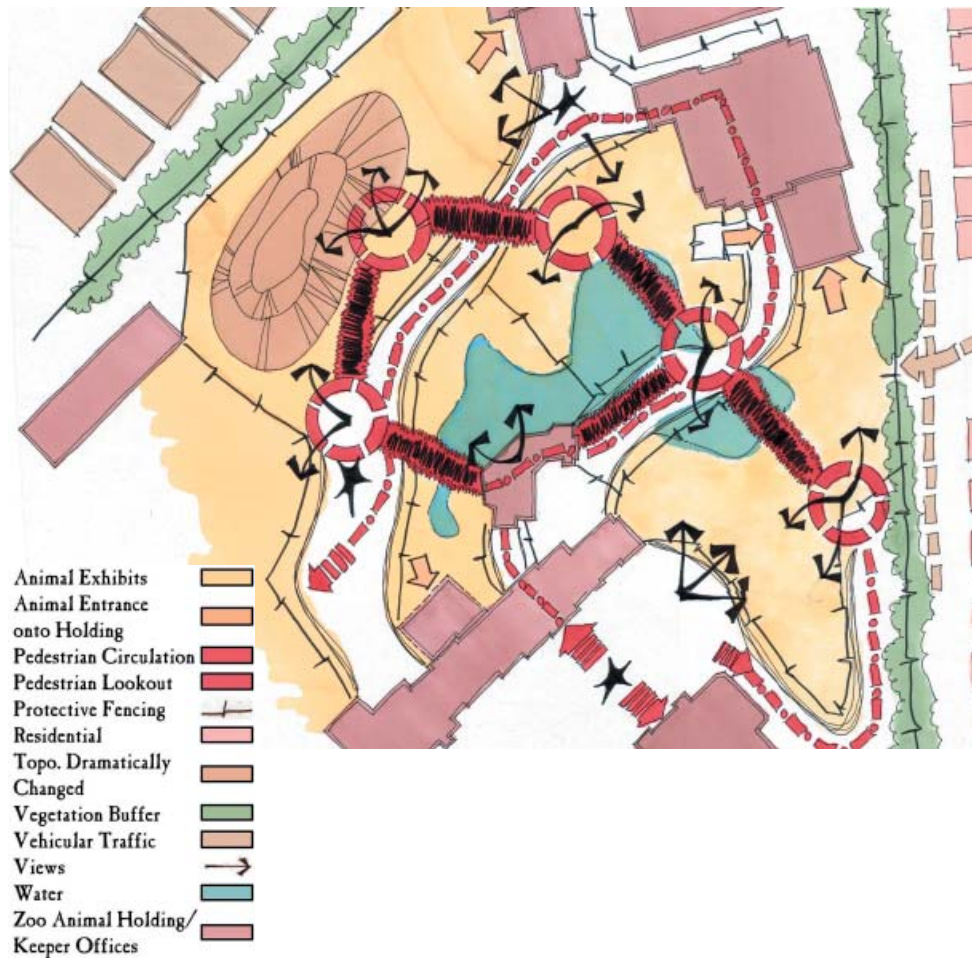


**The Low Impact Concept:**  
 This concept minimally changed the existing Savanna area at the Toledo Zoo. The new male African Elephant exhibit will be located in the Children's Zoo and this concept shows this here. There is a new viewing area that visitors to the site will be able to see the elephants from above. This concept also expands the Rhino and Hippo exhibit so that the animals are able to move more freely. The visitor circulation connects to the proposed Predator Canyon, which allows visitors to circulate from one side of the zoo to another by viewing different animal species continuously.

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**concepts**





**Medium Impact Concept:**  
 This concept changed the existing Savanna area by incorporating three levels of pedestrian circulation. The three levels are below ground in the water, at eye level, and from the tree tops. There are pedestrian bridges that connect each lookout hut from one to the other so that people are able to walk above the animals. The circulation at eye level has remained the same, but there is now bridges that cross over the walks as a visitor strolls through the Pachyderm area of the Toledo Zoo. This concept also expands the Rhino and Hippo exhibit so that the animals are able to move more freely in their space. The visitor circulation connects to the proposed Predator Canyon, which allows visitors to circulate from one side of the zoo to another by viewing different animal species continuously.

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ZOO**

**concepts**



## High Impact Concept:

This concept changed the existing Savanna area by incorporating three levels of pedestrian circulation. The three levels are below ground in the water, at eye level, and from the tree tops. There are pedestrian bridges that connect each lookout hut from one to the other so that people are able to walk above the animals. The circulation through the African Elephant Holding has been redesigned, which is what causes this concept to be high impact. The circulation at eye level has changed; this concept does not split the two African Elephant exhibits with a pedestrian walkway. There is a hidden fence that separates the exhibits so that the female and male elephant do not become aggressively territorial. This concept also expands the Rhino and Hippo exhibit so that the animals are able to move more freely in their space. The visitor circulation connects to the proposed Predator Canyon, which allows visitors to circulate from one side of the zoo to another by viewing different animal species continuously.

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**ZOO**

**concepts**



### **Why in the Treetops?:**

The African Savanna has numerous tall species of trees, which would allow for the cultures of the Savanna to be above the animals. The Masai do not put their homes in the trees, but I feel that adding this feature to the existing exhibits gives an interesting view to the Pachyderm area of the Toledo Zoo. Visitors to the Pachyderm Savanna will be able to appreciate the culture that surrounds these species of animals and understand what it would be like to be apart of the Savanna habitat.

### **Why Huts in the Treetops?:**

The Masai are people who live along the border of Kenya and Tanzania and they occasionally have to move their homes from time to time to follow the source of food. They depend on cattle for various things such as the dung to seal their homes and to drink the cow's milk and blood as a sacred drink. Surprisingly they do not slaughter the cattle for food, but if one dies then their needs are met. Such as their horns for containers, the hides for shoes, clothing, the hooves and bones are made into ornament, and the meat is eaten for nourishment. If a man owns less than 50

cattle then he is considered poor, but the cattle is for the benefit for the whole family.

The homes of the Masai are made from sticks and grass, which are held together with a mixture of mud and cow dung. They are constructed in a circle and they make up an enkang, a Masai Village. They are meant to be temporary. The Masai protect their village from animals entering by surrounding the enkang with a wall of thorn-tree branches. This setup is not only to protect the people, but even more importantly the cattle in the krall, in the middle of the village.

### **What the different huts may include:**

- ~ A hut all about what the women of the tribe do day-to-day
- ~ A hut all about what the men of the tribe do day-to-day
- ~ A hut all about the art and culture of the tribe
- ~ A hut all about their spirituality
- ~ A hut all about their diet
- ~ A hut all about their recreational activities
- ~ A hut all about how they create their homes



## **Masai Tribe Interpreted:**

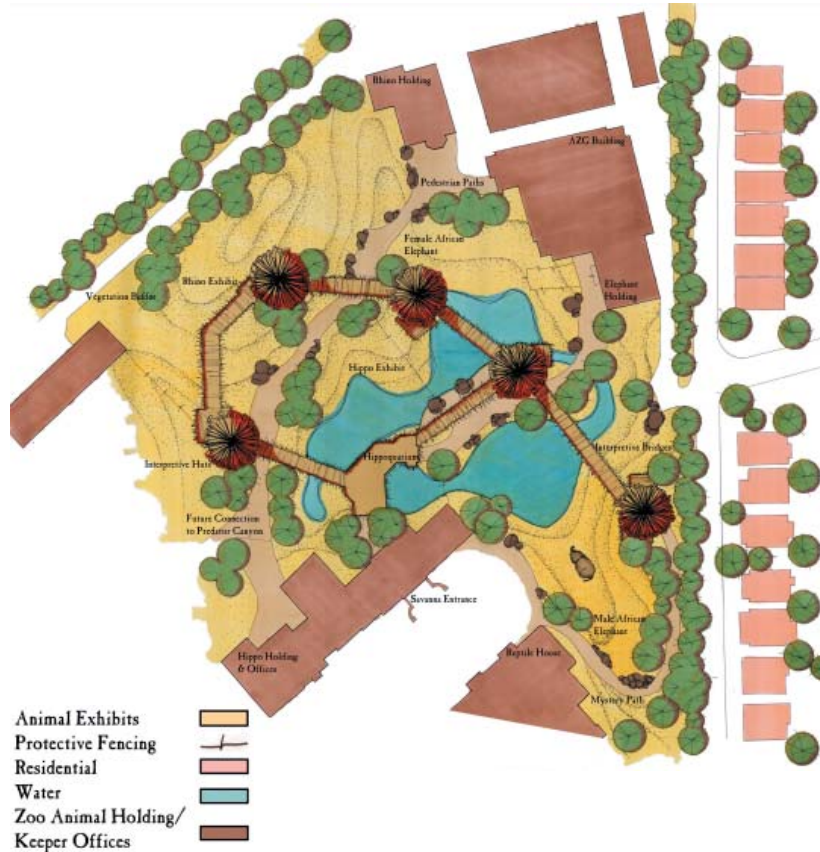
The Savanna currently has signage describing the native habitats of the pachyderm species. They have been updated, but there has not been a major educational force that has swept through the Savanna to truly enforce the habitat of the species. I am proposing to do this by incorporating a native tribe that would also inhabit the area that the pachyderms naturally live. I have chosen to Masai tribe that lives on the boarder of Kenya and Tanzania.

I have also chosen to design the interpretation in a functional way that will benefit the design layering theme. The Masai interpretive huts are on an upper level of the Savanna. This way people are able to understand what it would be like to be a native tribesman living around the pachyderm species and the visitors to the zoo are also able to enjoy the animals from the above.

I got the idea of incorporating a native tribe to the Savanna from the case studies that I looked at in the Kansas City Zoo and at the Woodland Zoo. I feel that this type of interpretation will be successful because visitors to the zoo will be able to better understand the importance of the natural environment that these pachyderm species originally inhabit.

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**savanna interpreted**



This drawing represents my design stage at the semester. The design at this phase was diagrammatic, but it was beginning to take solid form and really represent what I was trying to portray in my design ideas. As the design progressed and I was finishing up this drawing it began to become clear to me that there was a need for some major changes in the next phase of the design process.

For example this drawing shows the interpretive upper level on the roof of the Hippoquarium. I began to have doubts if this was needed in the Savanna exhibit and decided to remove the 2 bridges that lead to the roof of the Hippoquarium. I also decided to remove the platform that acted as a shell around the Hippoquarium structure. I felt that the 5 Masai interpretive huts were sufficient for the exhibit space.

At this phase in the design process I realized that the topography under the bridges was going to sink so that when the large African Elephants passed under them they would not pierce the bridge with their tusks. All African Elephants have tusks, male and female so this is a serious problem. I decided that the topography needed to be sunk under the bridges so that the bridges would not have to be as tall as they would be if the topography remained the same.

## schematic design

The huts and bridges are also exaggerated in this drawing to indicate where there actual location would be in the final design. I began to think about the actual sizes of these elements at this phase and it is evident in my detail plan how much smaller they became as the design became more detailed.



This drawing represents the changes that were made from the midterm review to the final design decisions that I made. It is evident from this drawing the interpretive Masai huts became large enough to fit 10-15 people in them comfortable so that a small lesson is possible from and interpreter. The bridges also became less wide; they are now able to carry one person single file across and they are still ADA assessable. This indicates that there is only one way to walk through the upper level pedestrian paths, which is what I intended for the design.

This idea will allow for less traffic and for people to move through the upper level quickly and more efficiently. This decision was made so that the animals would not feel so intimidated with loud noises from above. People are going to be encouraged to be silent when they are above on the bridges and when they get to the interpretive huts they will be able to discuss what they experienced when viewing the large pachyderms from above. I also decided that visitors strolling through the upper level will have to do so with an interpreter on staff so that the safety of the animals is kept always and the groups should be no larger than 15 when children are involved. I made this decision so that the animals do not feel like they are constantly being watched from above. So

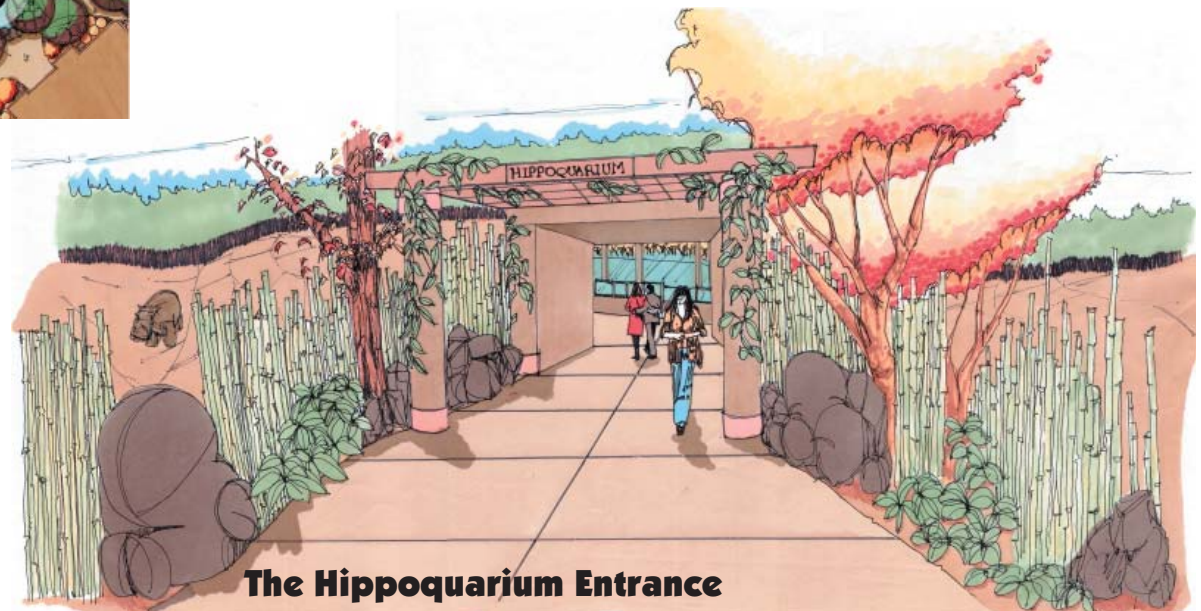
## detail plan design

in conclusion the upper level viewing is a realistic option but it is an option with some limitations, but I am confident that people will wait and that it is worth the wait to view the species from an angle that is not so common.





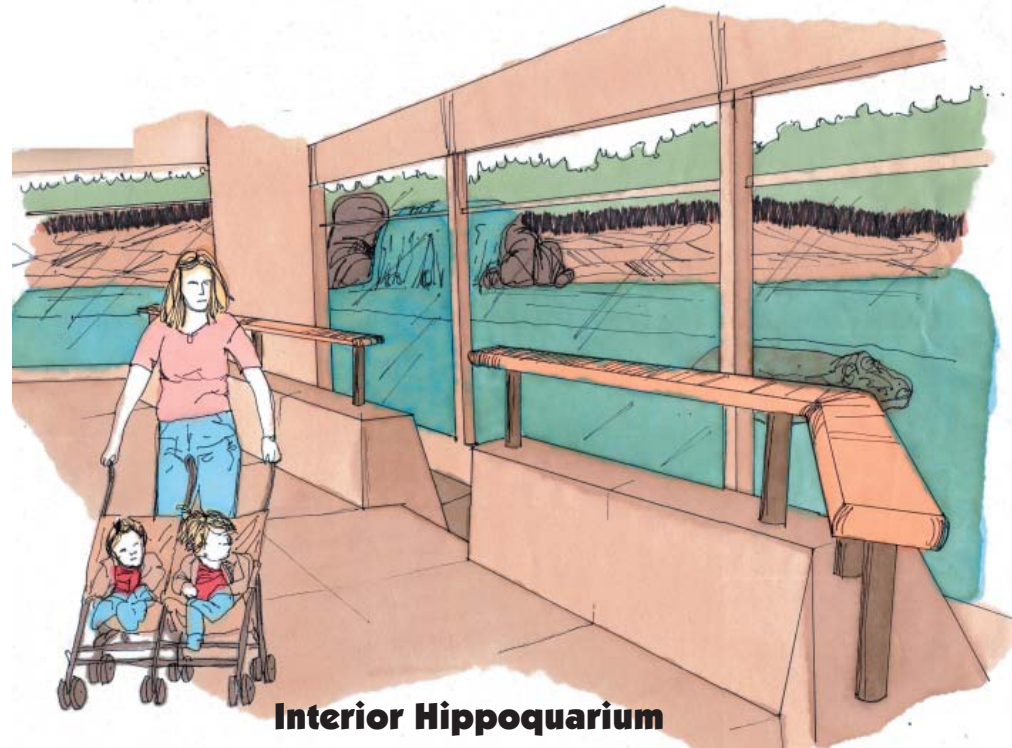
This drawing shows the entrance into the Hippoquarium with the split level viewing being seen in the distance. It also begins to identify the plant material that will enhance the Savanna feel in the exhibit spaces.



**The Hippoquarium Entrance**



**This drawing zooms in on the interior of the Hippoquarium so that it is clear how the Hippoquarium works. This drawing is what the exhibit currently looks like, but there has been an additional water feature to the exhibit to add more recreational aspects for the hippos.**



**Interior Hippoquarium**

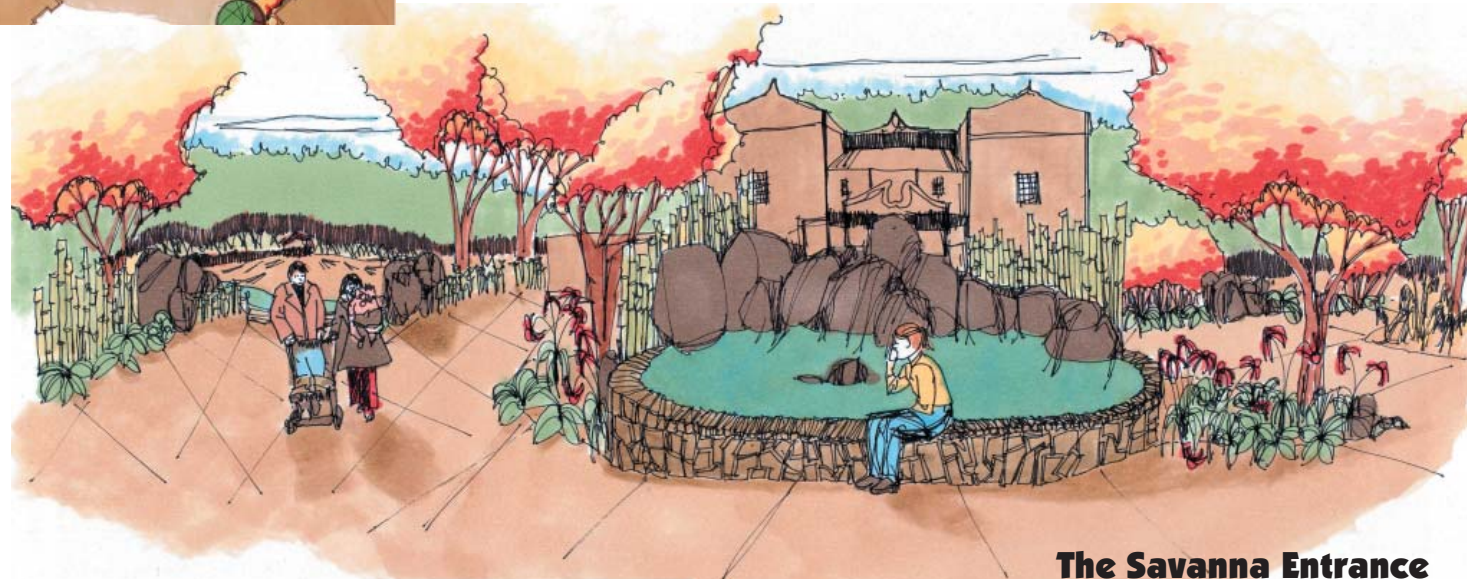
**toledo  
ZOO**

**hippo expansion - 2**





**This drawing represents the design changes that I have proposed in the area just outside the existing Savanna entrance. The fountain is a new idea and it is appropriate because it follows the theme of the watering hole. The plant material in the entrance area also acts as a transition phase into the Savanna area. This has been accomplished by implementing tall grasses and prairie like plant material.**



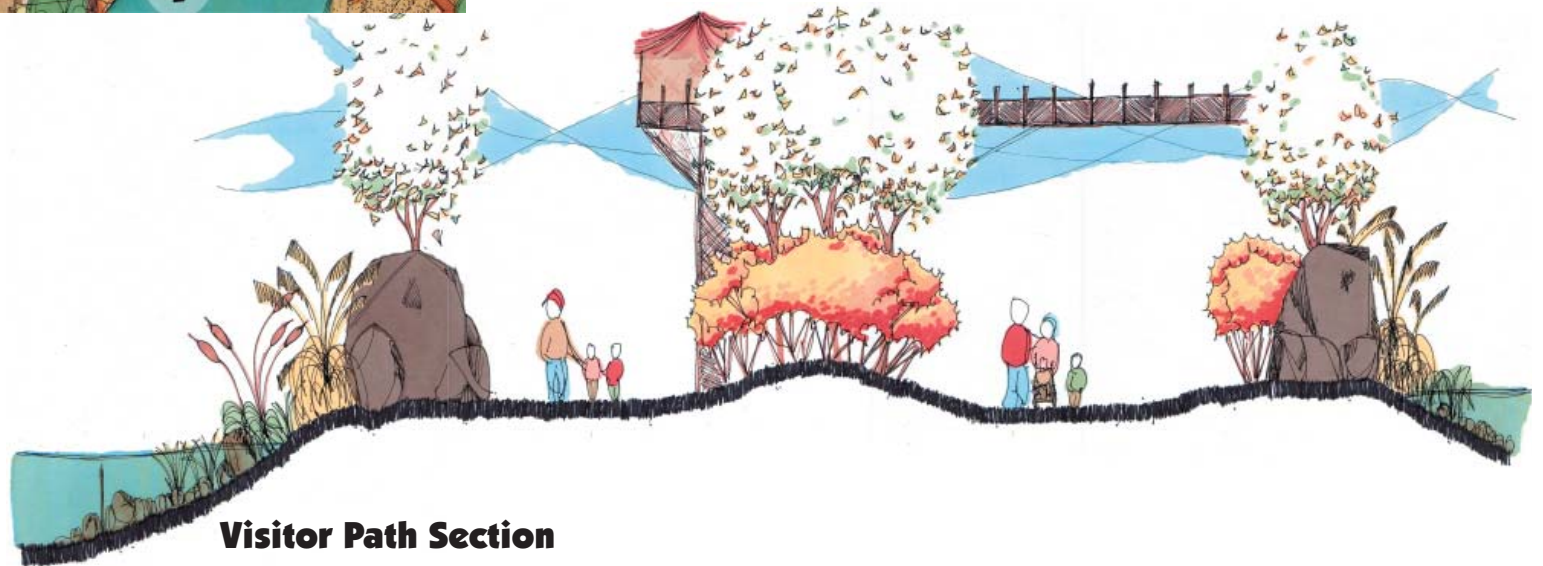
**The Savanna Entrance**

**toledo  
ZOO**

**hippo expansion - 3**



**This section shows how the 2 different African Elephant Exhibits relate to one another. It also shows the upper level of visitor circulation and the interpretive Masai hut. This area is a small gathering space for groups to meet and discuss the exhibits and species that they are experiencing. It is a great area for curators to have short lessons taught.**



**Visitor Path Section**

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ZOO**

**female african renovation - 1**





**This drawing also shows how the 2 different African Elephant Exhibits relate to one another. This sketch also makes the pedestrian bridges understandable and how they relate to the species that they cross over.**



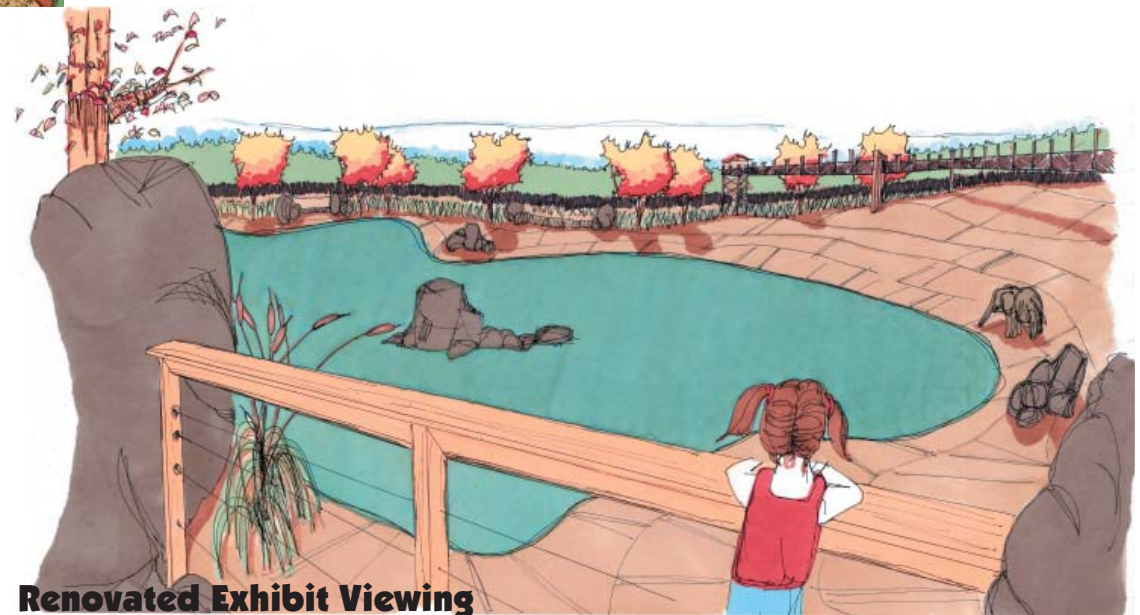
**Renovated & New  
Exhibit Viewing**

**toledo  
ZOO**

**female african renovation - 2**



**This drawing shows how the current watering hole has been enlarged so that the female African Elephants are able to go further into the water so that they are really able to cool down during the summer months. The acreage of the exhibit has also increased, which is evident from the plan to the right.**

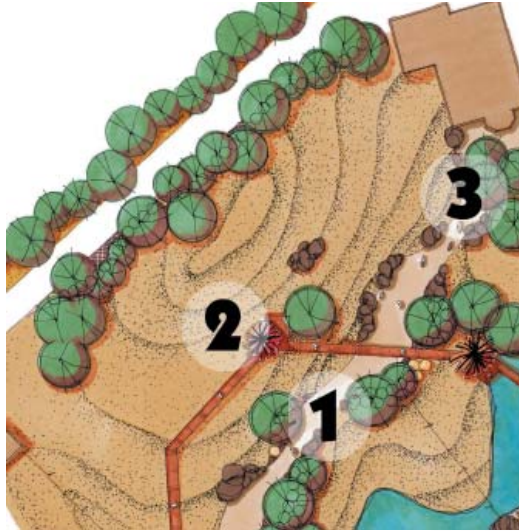


**Renovated Exhibit Viewing**

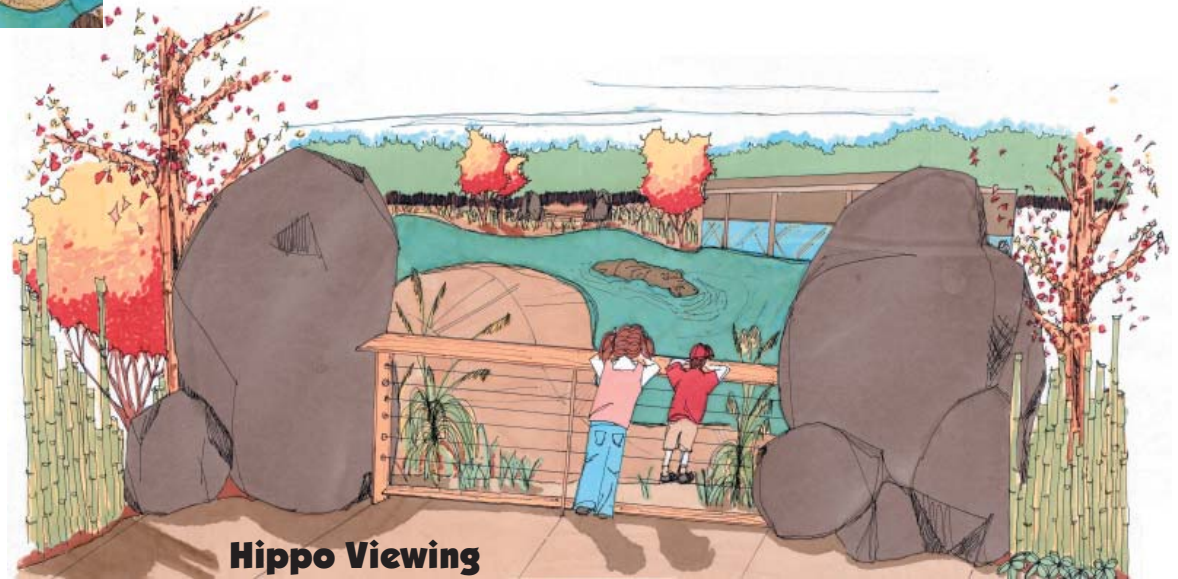
**toledo  
ZOO**

**female african renovation - 3**





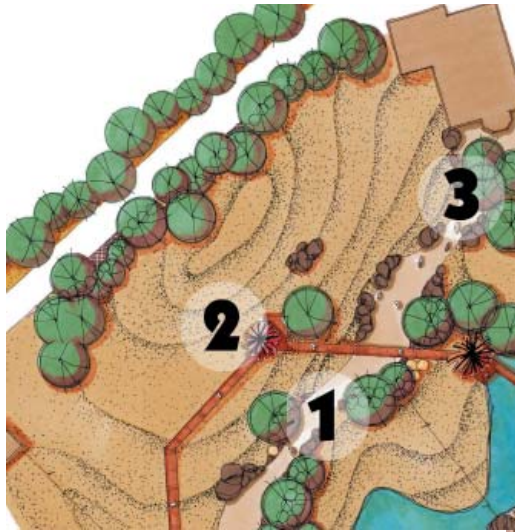
**This drawing shows how the hippos will be viewed from above the water. This is a new idea that is currently not possible because hippos spend 85% of their time in the water. However, when the hippo raises their head out of the water it is not possible to see the hippos. This view of seeing the hippoquarium from outside will allow this to be possible.**



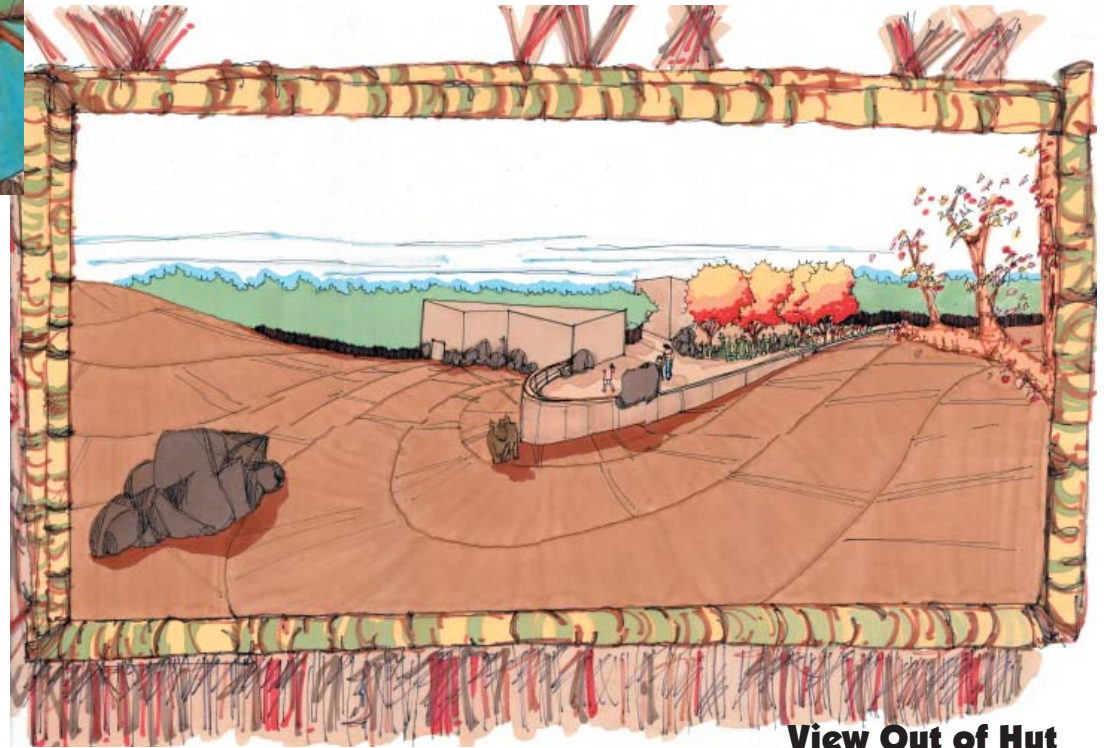
**Hippo Viewing**

**toledo  
ZOO**

**renovation of rhinocerus exhibit - 1**



**This drawing shows what it will look like when visitors look out of the interpretive Masai huts. It also clearly shows how the rhino mud pit is much more pleasant for the rhinos because of their poor eye sight as opposed to the water moat and the retaining walls.**

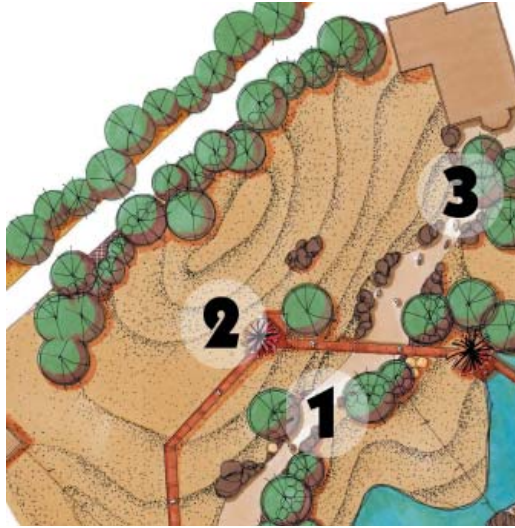


**View Out of Hut**

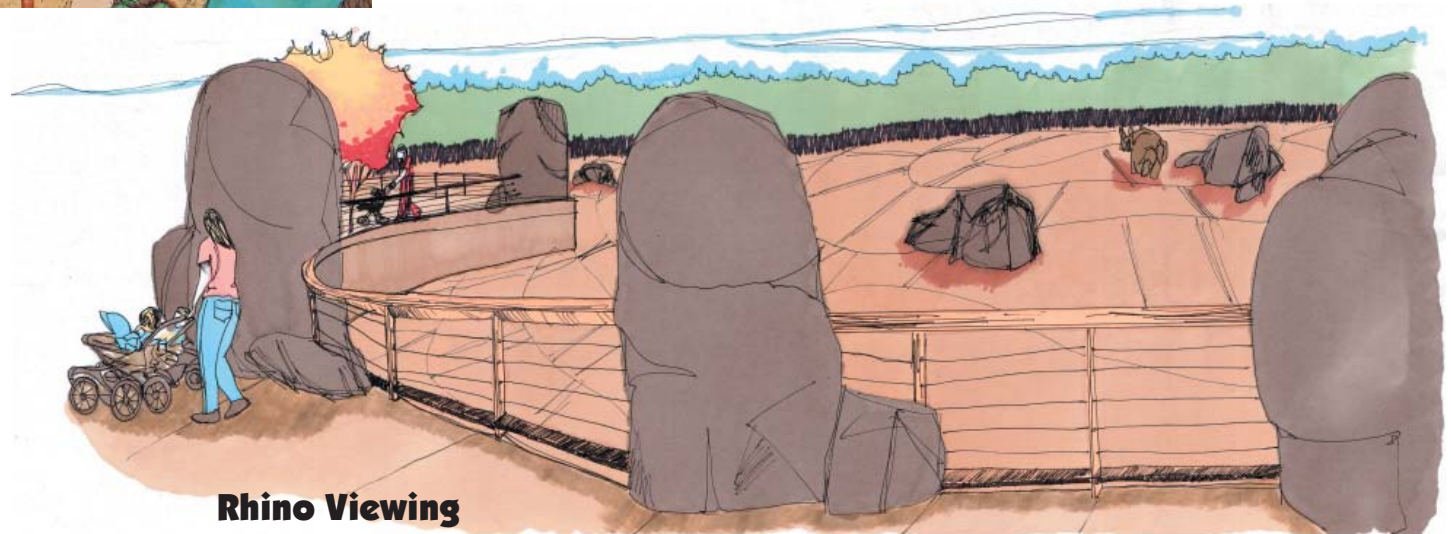
**toledo  
ZOO**

**renovation of rhinoceros exhibit - 2**





**This drawing shows how the rhinos and visitors are still safely separated without the use of a water moat. It is also clear that the topography in the exhibit is now rolling, which is beneficial to the rhinos because it is easier for them to move around.**

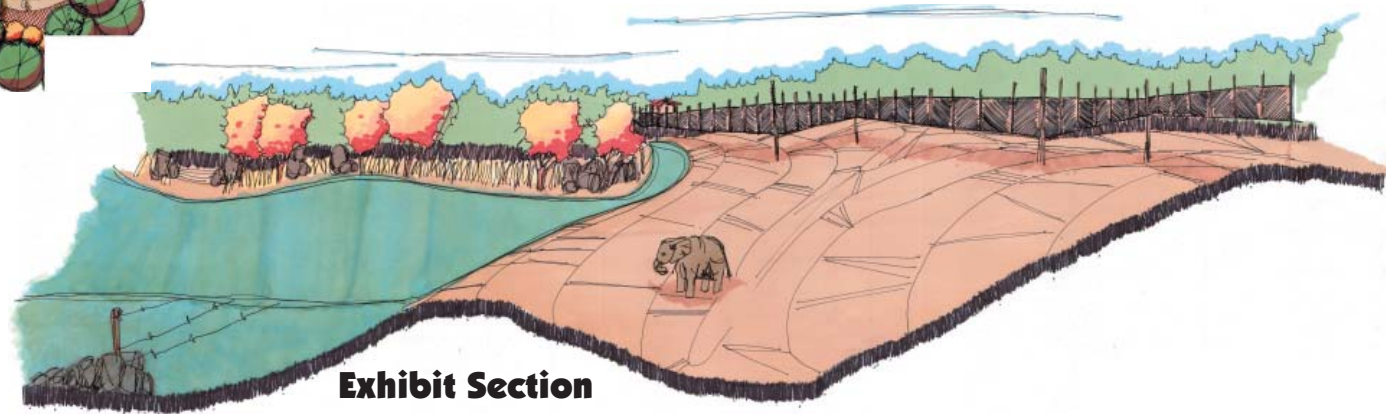
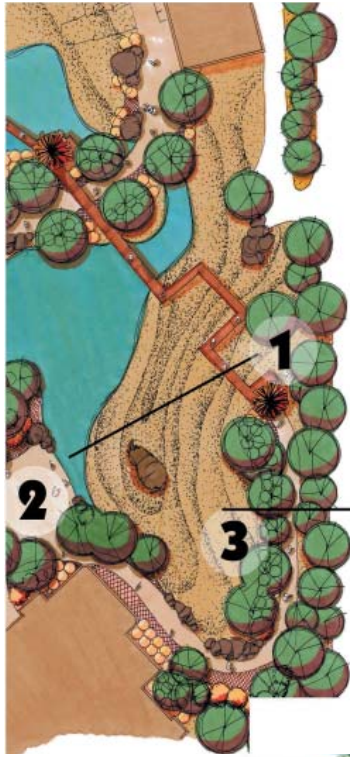


**Rhino Viewing**

**toledo  
ZOO**

**renovation of rhinoceros exhibit - 3**

**This section shows how the new male African elephant is able to have a pedestrian bridge cross over the exhibit. The pedestrian bridge is a possible because the topography under the bridge acts like a swale to lead the elephant into its' holding facility.**

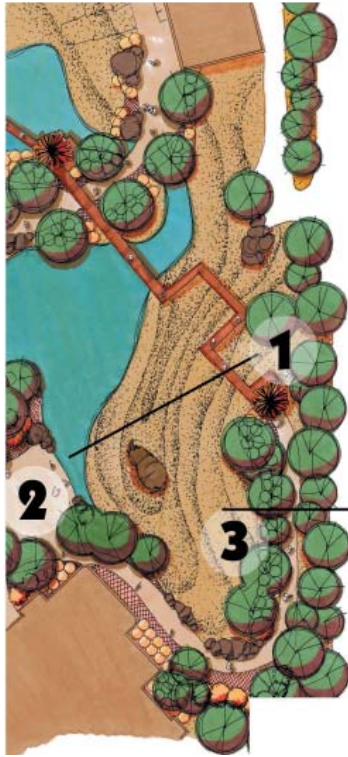


**Exhibit Section**

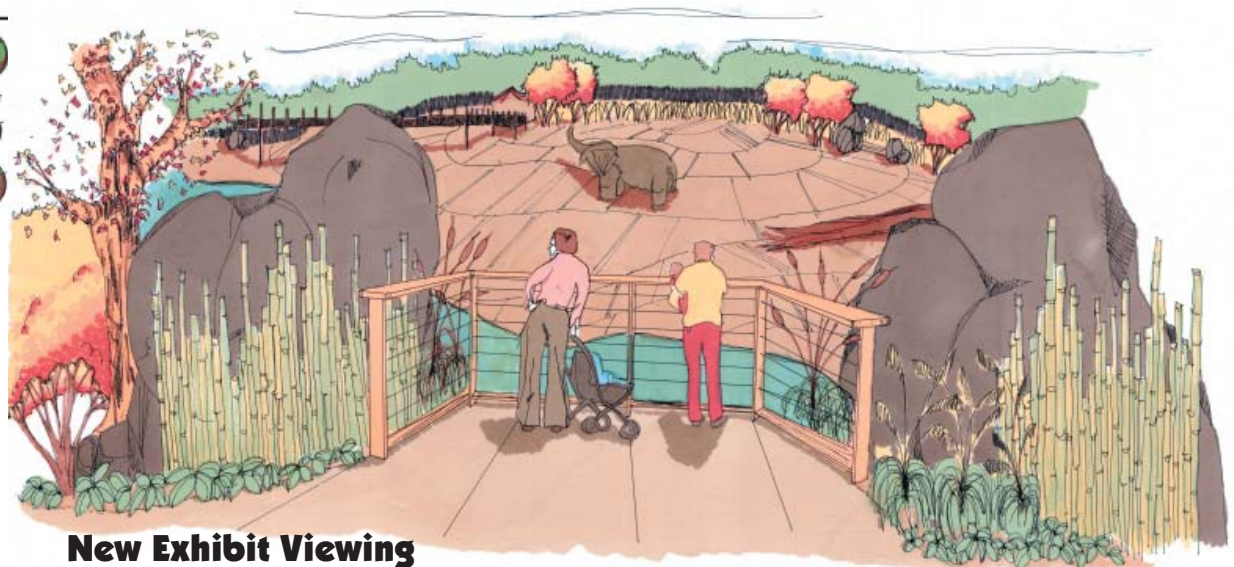
**toledo  
ZOO**

**new male elephant exhibit - 1**





**This sketch shows the new viewing area into the male elephant exhibit. It is evident that the topography slopes up slightly here also so that the elephant can be seen from a distance. The plant material in this sketch also enhances the Savanna feel with the tall grasses in the foreground as well as in the background.**

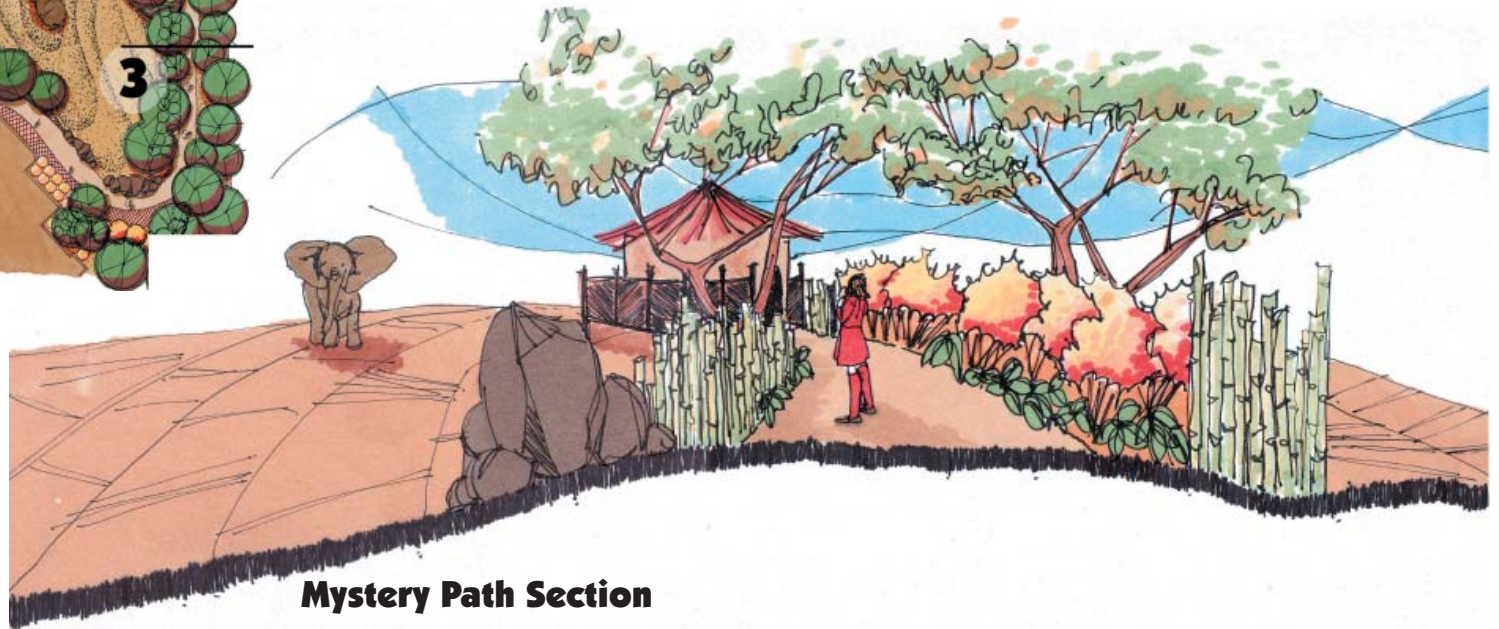
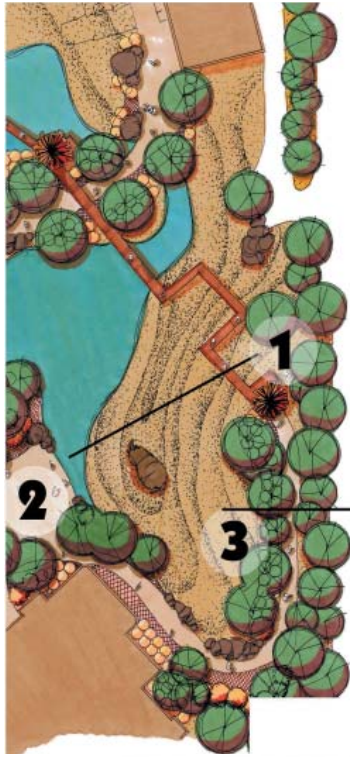


**New Exhibit Viewing**

**toledo  
ZOO**

**new male elephant exhibit - 2**

**This section shows the mystery path in relation to the new male calf exhibit. It also shows how thick the vegetation is in this area so that there is great anticipation built up before the first interpretive hut is reached. Once the hut is reached visitors are able to view the elephants from above.**



**Mystery Path Section**

**toledo  
ZOO**

**new male elephant exhibit - 3**



## 43



<b>AJ</b>	<b>8</b>	<b>Albizia julibrissen</b>	<b>Mimosa</b>
<b>AS</b>	<b>6</b>	<b>Acer saccharum</b>	<b>Sugar Maple</b>
<b>GD</b>	<b>23</b>	<b>Gymnocladus dioicia</b>	<b>Kentucky Coffeetree</b>
<b>GT</b>	<b>14</b>	<b>Gleditsia triacanthos var. Inermis</b>	<b>Thornless Honeylocust</b>
<b>KP</b>	<b>18</b>	<b>Koelreuteria paniculata</b>	<b>Golden Raintree</b>
<b>SJ</b>	<b>15</b>	<b>Sophora japonica</b>	<b>Japanese Pagoda Tree</b>
<b>ZS</b>	<b>3</b>	<b>Zelkova serrata</b>	<b>Japanese Zelkova</b>
<b>CP</b>	<b>6</b>	<b>Crataegus phaenopyrum</b>	<b>Washington Hawthorn</b>
<b>MA</b>	<b>20</b>	<b>Maackia amurensis</b>	<b>Amur Maackia</b>
<b>SA</b>	<b>31</b>	<b>Salix alba 'Britzensis'</b>	<b>Coral Embers Willow</b>
<b>CA</b>	<b>84</b>	<b>Calamagrostis alopecuroides 'Karl Forester'</b>	<b>Karl Forester Feather Reed Grass</b>
<b>MG</b>	<b>78</b>	<b>Miscanthus sinensis 'Giganticus'</b>	<b>Giant Grass</b>
<b>MZ</b>	<b>74</b>	<b>Miscanthus senensis 'Zebrinus'</b>	<b>Zebra Grass</b>
<b>PA</b>	<b>115</b>	<b>Phyllostachys aureosulcata</b>	<b>Yellow Groove Bamboo</b>
<b>PH</b>	<b>58</b>	<b>Plieoblastus hogumosasa</b>	<b>Pygmy Bamboo</b>
<b>EP</b>	<b>234</b>	<b>Echinacea purpurea</b>	<b>Purple Cone Flower</b>
<b>LS</b>	<b>208</b>	<b>Liriope spicata</b>	<b>Lilly Turf</b>
<b>RH</b>	<b>188</b>	<b>Rudebeckia hirta</b>	<b>Black Eyed Susan</b>

## plant list





**To conclude, I just wanted to say that I enjoyed working with this specialized type of design that landscape architects do not get to partake in too often. There are some companies like Jones & Jones and CLR Design who do participate with this type of design quite often and I hope to get to partake in this type of design during my professional career. I learned a lot while researching and designing for the pachyderm species and I have only begun to chip away at the extensive research that is available to better understand the species and to design a great habitat for them. I do however; feel that with the research that I looked at what I have provided in this work that I have built my case as to why this alternate design concept for the Savanna at the Toledo Zoo would be a successful design. The ultimate goal of this work is to be a spring board of ideas for professional companies to look at as some possible design ideas. I hope that you enjoyed looking through my work and that you are able to at least some what understand the amount of time is needed to successfully design a natural habitat for captive animals.**

**Toledo Zoo specifically:**

- ~ Daron Graves, large mammal curator
- ~ Rick Payeff, head of construction
- ~ Don Redfox, head of elephant keeper
- ~ Robin Gould, head rhino keeper
- ~ Alan Donges, naturalist

**CLR Design Inc. from Philadelphia, PA**

- ~ Greg Dykstra, provided Toledo Zoo base information and an interview to discuss the Arctic Encounter, which I used as a case study

**Basset & Associates**

- ~ Greg Skinner, provided me with photographs and an interview to discuss the Kansas City Zoo that I also used as a case study

**thank you's**

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